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Schaupp, Jr. et al.

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[54] **RADIOTELEPHONE OPERATING TECHNIQUE**

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[73] Assignee: **Motorola, Inc.**, Schaumburg, Ill.

[*] Notice: This patent is subject to a terminal disclaimer.

[21] Appl. No.: **08/711,578**

[22] Filed: **Sep. 10, 1996**

Related U.S. Application Data

[63] Continuation of application No. 08/544,742, Oct. 18, 1995, Pat. No. 5,594,778, which is a continuation of application No. 08/228,173, Apr. 15, 1994, abandoned, which is a continuation of application No. 07/650,346, Feb. 4, 1991, abandoned.

[51] **Int. Cl.**[6] **H04Q 7/32**

[52] **U.S. Cl.** **455/564**; 455/550

[58] **Field of Search** 455/564, 550, 455/403, 418, 566; 379/354, 355, 356, 368

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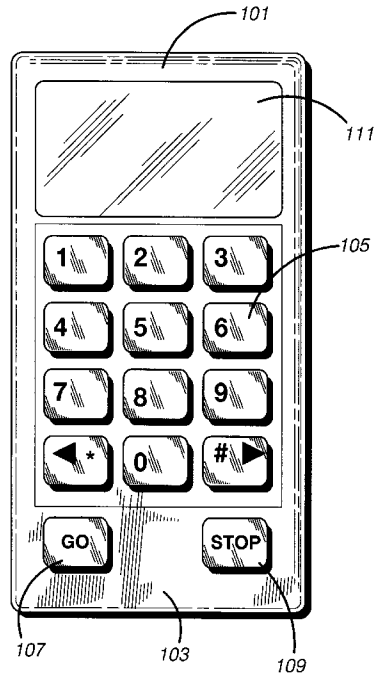
Assistant Examiner—Myron K. Wyche
Attorney, Agent, or Firm—John J. Oskorep

[57] **ABSTRACT**

The present disclosure includes a discussion of an operating technique for a radiotelephone **(101)**. The radiotelephone **(101)** has a memory **(907)**, a display **(127)** and a keypad **(117)** which includes a first function key **(107)**, a second function key **(109)**, and a plurality of data keys **(119)**. An actuation of the first function key **(107)** creates a first function key signal for recalling a telephone number. Once the telephone number has been selected, a subsequent actuation of the first function key **(107)** creates a second function key signal for connecting a call based on the telephone number. During the call, an actuation of the second function key **(109)** creates a third function key signal for disconnecting the call. A subsequent actuation of the second function key **(109)** creates a fourth function key signal for turning off the radiotelephone **(213)**.

13 Claims, 6 Drawing Sheets



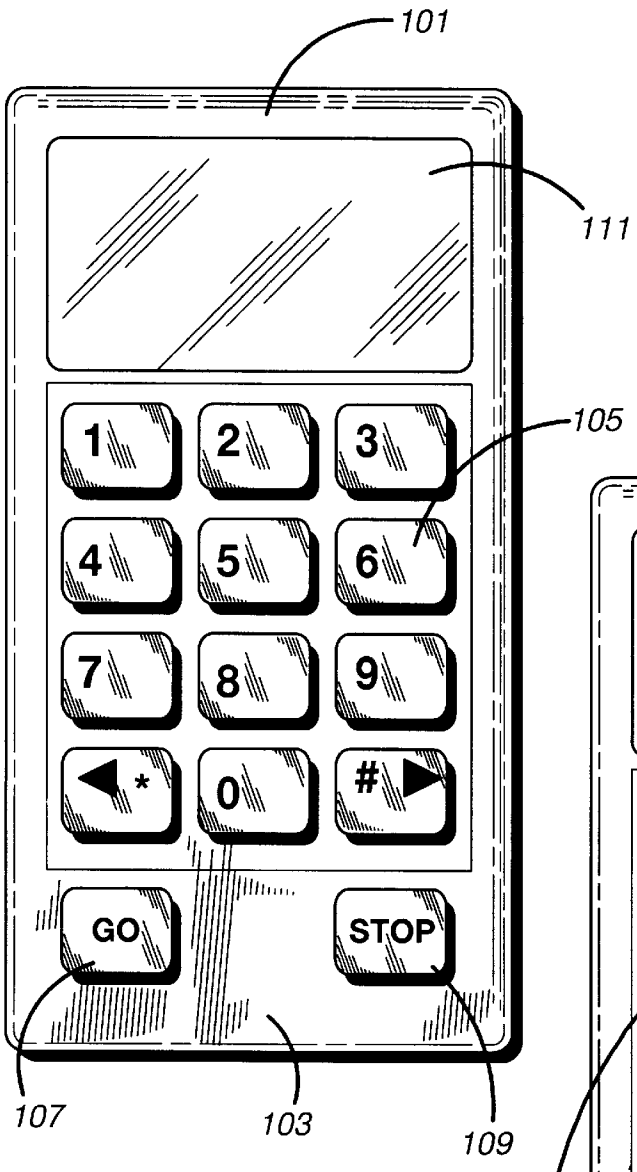

101
111
105
1
2
3
4
5
6
7
8
9
*
0
#
GO
STOP
107
103
109

FIG. 1

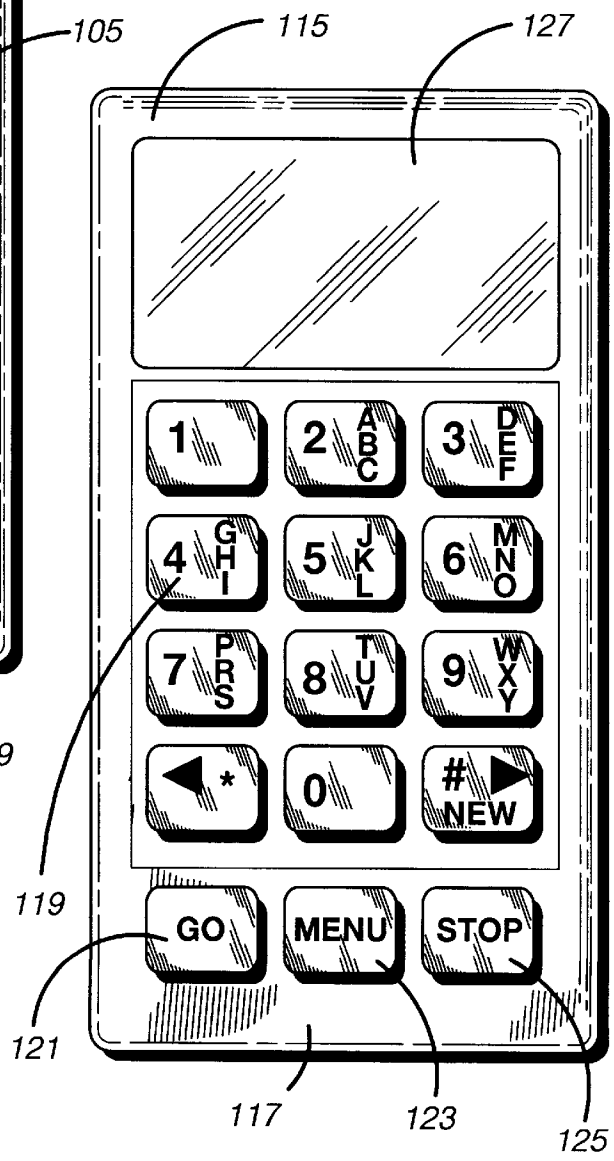

115
127
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PRS
8 TUV
9 WXY
*
0
NEW
119
GO
MENU
STOP
121
117
123
125

FIG. 2

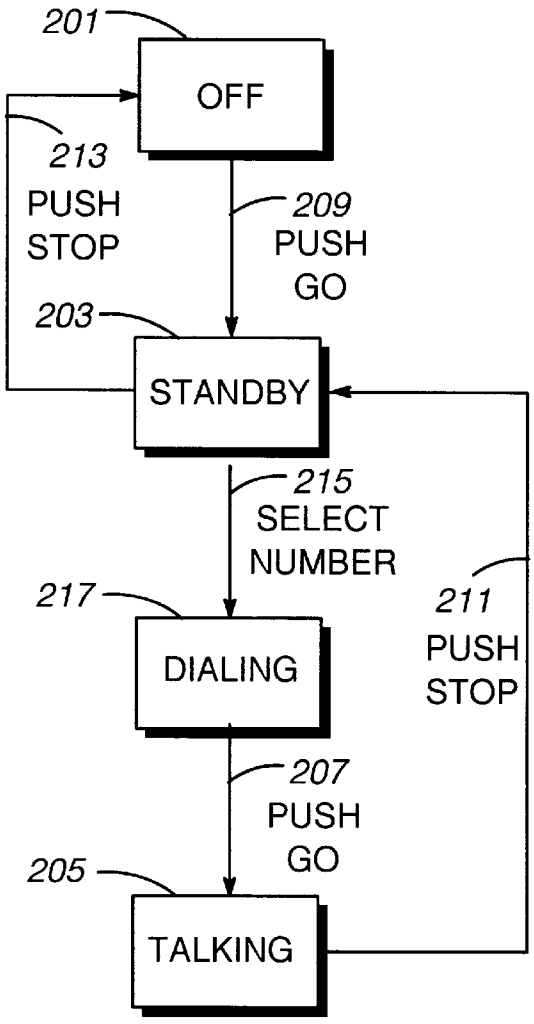

201
OFF
213
PUSH
STOP
209
PUSH
GO
203
STANDBY
215
SELECT
NUMBER
217
DIALING
211
PUSH
STOP
207
PUSH
GO
205
TALKING

FIG. 3

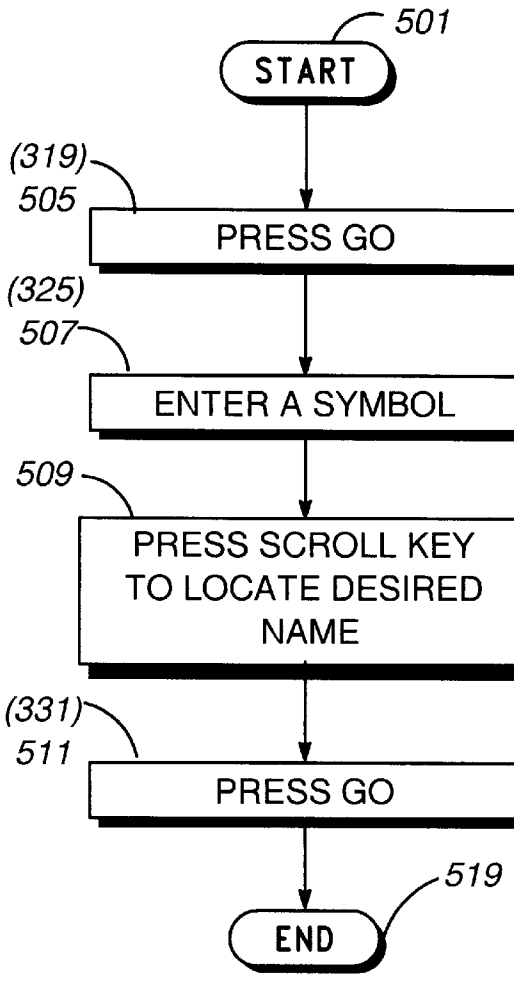

501
START
(319)
505
PRESS GO
(325)
507
ENTER A SYMBOL
509
PRESS SCROLL KEY
TO LOCATE DESIRED
NAME
(331)
511
PRESS GO
519
END

FIG. 6

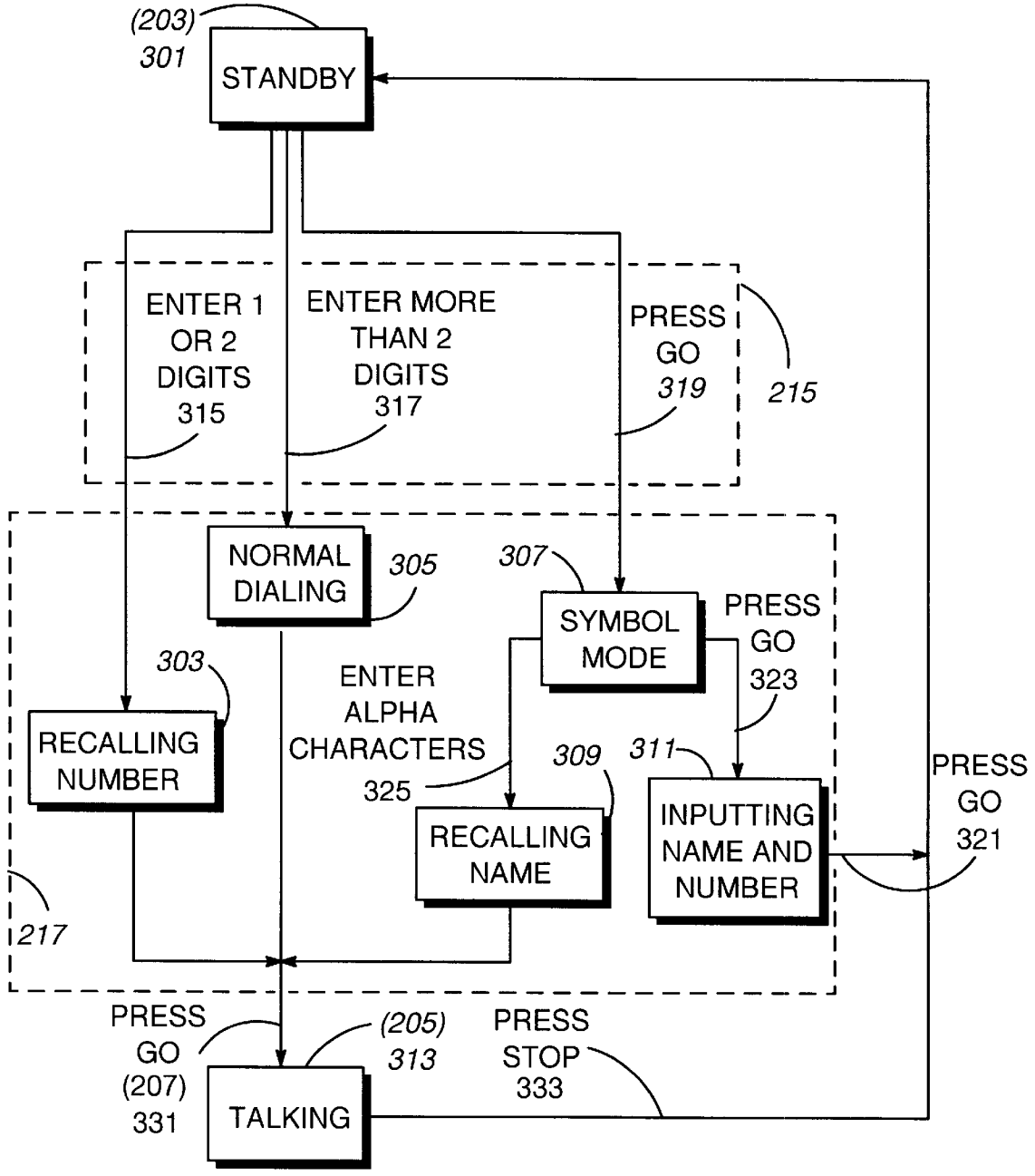

(203)
301
STANDBY
ENTER 1 OR 2 DIGITS 315
ENTER MORE THAN 2 DIGITS 317
PRESS GO 319
215
NORMAL DIALING
305
307
SYMBOL MODE
PRESS GO 323
303
RECALLING NUMBER
ENTER ALPHA CHARACTERS 325
309
311
RECALLING NAME
INPUTTING NAME AND NUMBER
PRESS GO 321
217
PRESS GO (207) 331
(205) 313
TALKING
PRESS STOP 333

FIG. 4

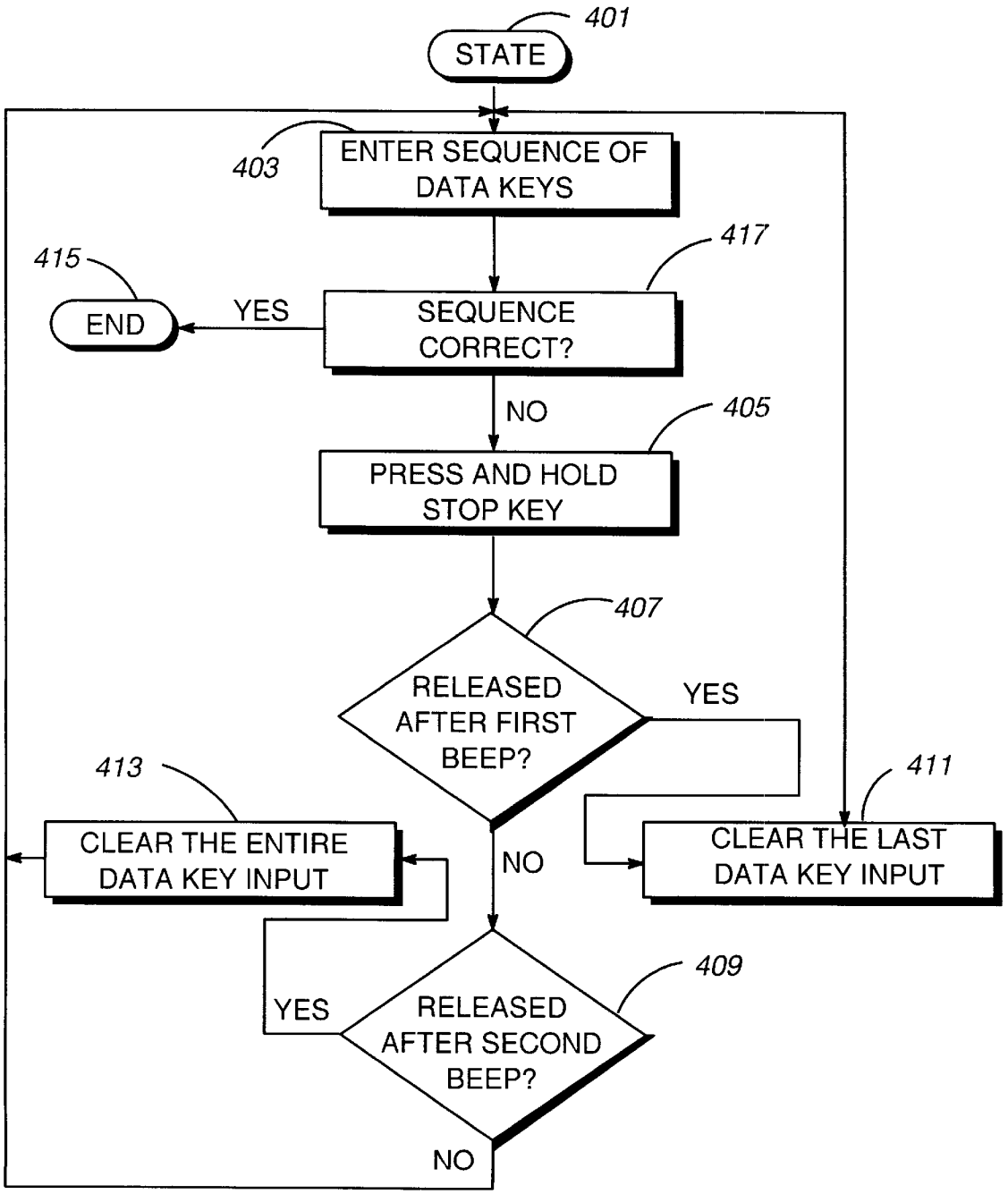
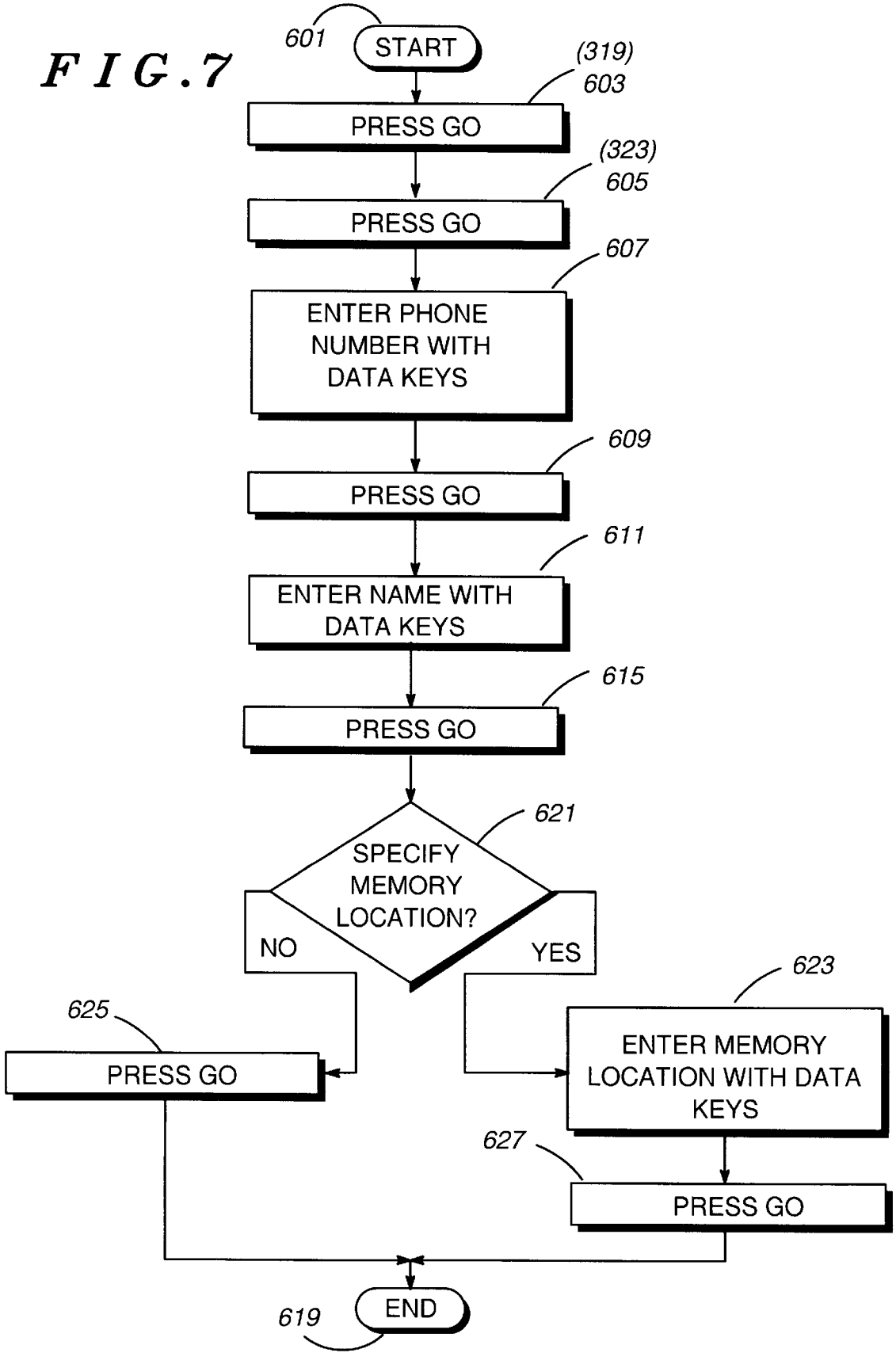

401
STATE
403
ENTER SEQUENCE OF DATA KEYS
417
415
END
YES
SEQUENCE CORRECT?
NO
405
PRESS AND HOLD STOP KEY
407
RELEASED AFTER FIRST BEEP?
YES
413
411
CLEAR THE ENTIRE DATA KEY INPUT
NO
CLEAR THE LAST DATA KEY INPUT
409
YES
RELEASED AFTER SECOND BEEP?
NO

FIG. 5

FIG. 7


601
START
(319)
603
PRESS GO
(323)
605
PRESS GO
607
ENTER PHONE NUMBER WITH DATA KEYS
609
PRESS GO
611
ENTER NAME WITH DATA KEYS
615
PRESS GO
621
SPECIFY MEMORY LOCATION?
NO
YES
625
PRESS GO
623
ENTER MEMORY LOCATION WITH DATA KEYS
627
PRESS GO
619
END

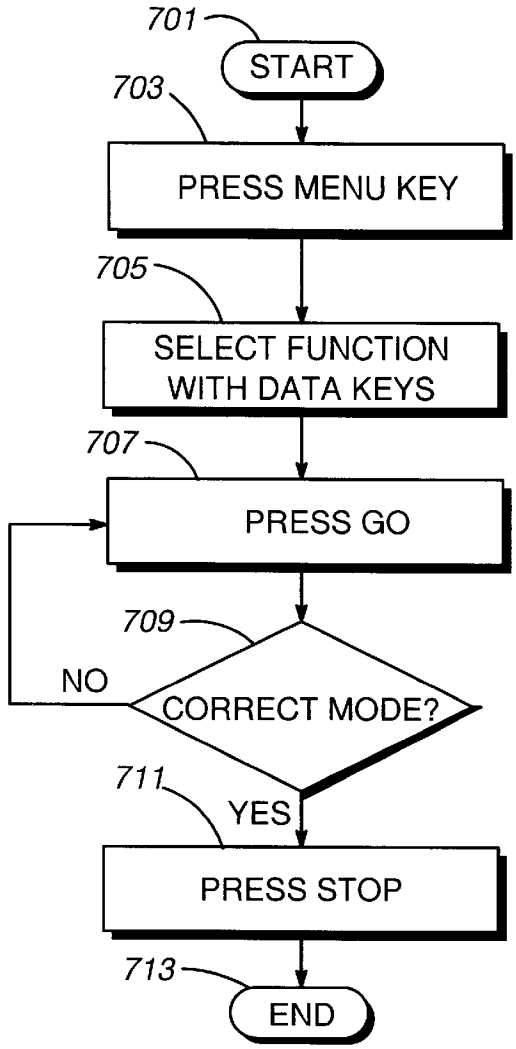
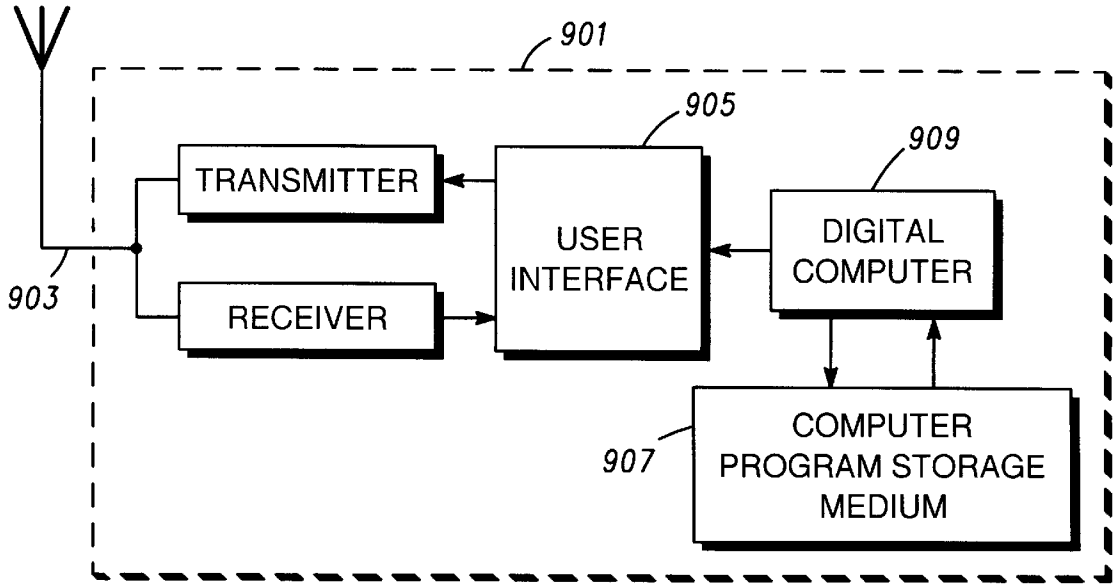

701
START
703
PRESS MENU KEY
705
SELECT FUNCTION WITH DATA KEYS
707
PRESS GO
709
NO
CORRECT MODE?
711
YES
PRESS STOP
713
END

FIG. 8

FIG. 9


901
905
909
TRANSMITTER
USER INTERFACE
DIGITAL COMPUTER
903
RECEIVER
907
COMPUTER PROGRAM STORAGE MEDIUM

RADIOTELEPHONE OPERATING TECHNIQUE

The instant application is a contiuation application based on application Ser. No. 08/544,742 filed on Oct. 18, 1995, now U.S. Pat. No. 5,594,778 issued on Jan. 14, 1997, which is a continuation of application Ser. No. 08/228,173 filed Apr. 15, 1994 and now abandoned, which is a continuation of application Ser. No. 07/650,346 filed Feb. 4,1991 and now abandoned.

FIELD OF THE INVENTION

This invention is generally related to radiotelephones and more specifically to methods of operating a radiotelephone.

BACKGROUND OF THE INVENTION

There is essentially one known technique of using a keypad for controlling a radiotelephone. The technique uses from four to twelve function keys in addition to the standard twelve key data pad and it includes a display for the data input.

The function keys generally include some or all of the following functions: send, end, power, recall, store, clear, function, name, volume and menu. The number and type of keys depends on the manufacturer and the features on the phone.

The function keys which are essential to the operation of the phone are the send, end, power and clear keys. The send key is used to initiate a phone call to the number entered with the data keys and located in the display. The end key is used to end a phone call. The power key is used to turn the radiotelephone on and off with successive key activations. The clear button is used when entering data to clear either one character of data or the entire display of data, depending on how the key is used.

There are three keys which can be used to store and recall names and phone numbers from the radiotelephone memory, namely, the store key, the recall key, and the name key. The store key is used to store data into a memory location. First, the data is entered into the radiotelephone with the data keys, then the store key is pressed, followed by a memory location entered with the data keys. This data can be either symbols, representing names or numbers representing phone numbers. The recall key followed by an appropriate memory location will recall the phone number or name contained within that memory location. The name key is used to activate a menu of names which have phone numbers corresponding to them. The user can scroll through the menu of names using the "#" and the "*" keys.

There are other keys which activate features of the phone which vary between manufacturers. The function key is used to activate other features of the phone denoted by the number input with the data keys which follow activation of the function key. Finally, the menu key is used to access a menu of advanced features which can be scrolled through using the "#" and the "*" keys.

With thorough knowledge of the operation of these keys, a complicated radiotelephone can be successfully operated. However, a high percentage of people do not access the advanced features of the phone because of lack of understanding of the complexities involved in such use. Therefore, there exists a need for an improved technique for operating a radiotelephone; one in which the operation of the radiotelephone is intuitive to the uneducated user.

SUMMARY OF THE INVENTION

The present invention encompasses a method of operating a radiotelephone. The radiotelephone has a memory, a display and a keypad with at least one key to produce at least a first function key signal and a second function key signal, and a plurality of data keys.

The method comprises creating a first function key signal from a first function key to turn on the radiotelephone; selecting a phone number; creating a second function key signal from said first function key, activating the radiotelephone to call said phone number; creating a third function key signal from a second function key disconnecting the radiotelephone from said call; and creating a fourth function key signal from said second function key, turning off the radiotelephone.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a drawing of an embodiment which may include the present invention.

FIG. **2** is drawing of an alternate embodiment which may include the present invention.

FIG. **3** is a state diagram of a basic phone call in accordance with the present invention.

FIG. **4** is a state diagram of selecting a phone number in accordance with the present invention.

FIG. **5** is a process flowchart of clearing data input from the display of a radiotelephone in accordance with the present invention.

FIG. **6** is a process flowchart of recalling a name from the memory of a radiotelephone in accordance with the present invention.

FIG. **7** is a process flowchart of storing a name and a phone number in the memory of a radiotelephone in accordance with the present invention.

FIG. **8** is a process flowchart of selecting a mode of a menu function of a radiotelephone in accordance with the present invention.

FIG. **9** is a block diagram of a radiotelephone which may employ the present invention.

DESCRIPTION OF A PREFERED EMBODIMENT

FIG. **1** reveals a first embodiment of the disclosed invention. The radiotelephone **101** contains a a display **111**, a keypad **103** which has a standard **12** data keys **105**, plus two additional function keys **107** and **109**. The standard 12 data keys contain the numbers from 0 to 9, the "#" key and the "*" key. The two additional function keys are the go key **107** and the stop key **109**.

FIG. **2** reveals a second embodiment of the disclosed invention it is a radiotelephone **115** having a display **127**, a keypad **117** containing a standard **12** data key inputs **119** containing symbols on the keys as follows: Data key **2** containing number 2 and alpha characters A, B, and C, data key **3** containing D, E and F, data key **4** containing G, H and I, data key **5** containing J,K and L, data key **6** containing M, N and O, data key **7** containing P, R and S, data key **8** containing T, U and V, and data key **9** containing W, X and Y. The "*" and "#" keys contain directional arrows. Although in this embodiment alpha characters are used, other symbols may substituted such as kata-kana, as described in U.S. Pat. No. 4,872,196, issued on Oct. 3, 1989 on behalf of Paul Royer et al., with the same assignee as the present invention, titled "Telephone Keypad Input Device". The keypad **117** also contains three function buttons, **121**, **123**, **125**. These are the go key **121**, the menu key **123** and the stop key **125**. The operation of these three function keys in the operation of the radiotelephone **101** follows.

FIG. **3** is a state diagram of a basic phone call in accordance with the present invention. The four states are the off state **201**, the standby state **203**, the dialing state **217** and the talking state **205**. In general, to transfer states the user must press a data key **119**, the stop key **125** or the go key **121**. Specifically, to transfer from the off state **201** to the standby state **203** the user must select the go key **209**. Moving from the standby state **203** to the off state **201** the user must select the stop key **213**. In order to move from the standby state to the dialing state **217**, the user must select a number **215**. Moving from the dialing state **217** to the talking state **205** requires pushing the go key **207**. To transfer from the talking state **205** to the standby state **203**, the user must push the stop key **211**.

FIG. **4** is an exploded view of selecting a number **215** and the dialing state **217** from FIG. **3**. There are three states within the dialing state **217**: normal dialing state **305**, recalling a number state **303**, and recalling a name state **309**. In order to transition between standby state **301** and the normal dialing state **305** the user must select a sequence of data keys which represent a phone number **317**, for this embodiment the sequence must be larger than two data keys. In order to transition between standby state **301** and the recalling number state **303** the user must select a sequence of data keys which represent a memory **907** location within the memory of the radiotelephone, **101** for this embodiment it is one or two data keys. In order to transition between the recalling name state **309** and the standby state, the user must first transfer to the symbol mode state **307** by pressing the go key **319**. The transfer from the symbol mode state **307** to the recalling name state **309** requires the user to enter a data key **119** which represents the symbol closest to the name in which the user is trying to recall at **325**. Once the user has reached one of the dialing states **303**, **305**, **309** pressing the go key **331** will place the **101** radiotelephone into the talking state **313**. Once in the talking state **313**, one may press the stop key **333** which will end the call and return the caller to the standby state **301**. While in the symbol mode state **307**, the user has the option of inputting a new name and phone number instead of recalling a name and phone number. This can be accomplished by pressing the go key **323**, thereby, transferring from the symbol mode state **307** to the inputting name and number state **311**. While in the inputting name and number state **311**, pressing the go key **321** will return the user to the standby state **301**.

At any point in time when entering a sequence of data keys it may be necessary to clear one of the inputs or the entire data input depending upon how severe the mistake. FIG. **3** reveals the process for clearing data from the display **111**. First, the process starts at **401**, at **403** the user enters the sequence of the data keys **105**, the user then will visually check the display **111** to see if the data is correct at **417**. At **405**, if it is not correct the user must press and hold the stop key **109**. If the user wants to clear the last data key input at **411**, then the stop key **109** must be released after the first beep at **407**. If the entire data key input is to be cleared at **413**, the stop key **109** must be released after the second beep at **409**. This process is repeated until the data displayed is correct, then process is stopped at **415**.

FIG. **6** is the process flowchart for recalling a name from memory **907** which is part of the dialing state **217**. The process is started at **501**. At **505**, the user presses the go key **121**, this is also shown in FIG. **4** as transition action **319**. Secondly, the user must enter a data key **119** which represents the symbol closest to the name in which the user is trying to recall at **507**. This puts the user into close proximity to the name in which he wants to recall. For example, on a standard key input, if the user was to recall Bill, he would press data key **2** because it contains the letters A, B and C. Next, the user would use the scroll keys located on the "*" and "#" keys to scroll either in ascending alphabetical order or descending alphabetical order at **509** until the name is located. After the correct name is displayed on the radiotelephone **101**, the go key **121** is pressed at **511**, this completes the process of recalling a name from memory **907** and is the transition state **331** noted in FIG. **3**.

FIG. **7** reveals the process which is used to enter phone numbers and corresponding names into the memory **907** of a radiotelephone **101** according to the present invention. The process starts at **601**. At **603**, the user presses the go key **121**, entering the symbol mode state **307**. At **605**, the user presses the go key **121**, enter the inputting name and number state **311**. Here, the user selects the sequence of data keys representing a phone number. At **609**, the user presses the go key **121** to store the number into the memory **907**. At **611**, the user enters the name which correlates to the above number with the data keys **119** . Symbols can be entered with the standard keypad data keys **119** by depressing the designated data key a selected number of times. For example, when entering the word Bill into the display one would push the following data keys: **22** "#" **444** "#" **555** "#" **555**. An alternate method of entering symbols is realized by pressing and holding the designated data key, the display **127** will scroll through the available symbols and when the key is released it holds the last displayed symbol. At any time during this data entry process the user may use the clear process as described in FIG. **5** to clear data key entries. At **615**, after the symbol is entered correctly, the user presses the go key **121**. At **621**, the user decides whether to enter the specific memory location. If the user wants to enter the memory location, at **623** the memory location is entered with the data keys **119** and at **627** the go key **121** is pressed. If the user does not want to enter the memory location, then the go key **121** is pressed at **625** and the name and phone number are stored in the next available memory location. Optionally, the user may input the new names and phone numbers into the radiotelephone by first selecting the "#" key and releasing it after two beeps have sounded. This would place the user at **607** in the preceding process.

FIG. **8** is a process flow chart of selecting modes of the menu functions. The functions include locking the phone, resetting the call timers, changing the unlock code or any of the functions that are available on a radiotelephone. The process starts by pressing a menu key at **703**. The menu key can be activated by holding down the "*" key until two beeps sound or by pressing a menu function key **123**, as shown in FIG. **2**. At **705**, the user enters the number representing the function with the data keys **119**. Typically, there is a user's manual that accompanies all phones that states the numbers of each function. At **707**, the go key **121** is pressed and the display shows the current mode of the function. If the mode is correct, at **711** the user presses the stop key **125**. If the mode is not correct, at **707** the user presses the go key **121**. The radio telephone will either toggle between two modes or step to the next mode if there are more than two possible modes. After the correct mode is selected at **709**, the user presses the stop key at **711** and it stores the proper mode of the function into the memory **907** of the radiotelephone **101**.

FIG. **9** is a block diagram of a radiotelephone **901** which may employ the present invention. The radiotelephone **901** includes a computer program storage medium **907**, commonly referred to as a memory device, a digital computer **909**, and an user interface **905**. The user interface **905**

includes a microphone, a speaker, a display, data keys and function keys. The display, data keys and function keys are illustrated in FIG. **1** and FIG. **2**. The computer program storage medium **907**, the digital computer **909** and the user interface **905** used in conjunction with each other to form a radiotelephone operations controller. The radiotelephone operations controller controls the function of the radiotelephone **901**.

Described herein is a method of controlling the functions of a radiotelephone with only two or three function keys. The radiotelephone **101** has many of the advanced functions of current radiotelephones without the complexity involved in utilizing the functions of the current radiotelephones. The functions as described are intuitive to the uneducated radiotelephone user.

What is claimed is:

1. A method of operating a radiotelephone, the radiotelephone including a memory, a display, and a keypad with at least a first single-throw function key, a second single-throw function key, and a plurality of data keys, the method comprising the steps of:

in response to an actuation of the first single-throw function key, entering a mode for accessing a telephone number from the memory;

in response to a subsequent actuation of the first single-throw function key, connecting a telephone call based on a selected telephone number;

in response to an actuation of the second single-throw function key, disconnecting the telephone call;

in response to a subsequent actuation of the second single-throw function key, turning off the radiotelephone; and

wherein said first single-throw function key does not revert back to the function of entering a mode for accessing a telephone number unless the telephone call has been disconnected by the actuation of the second single-throw function key.

2. The method in accordance with claim **1** further including the step of:

in response to an actuation of at least one key of the data keys occurring after the actuation of the first single-throw function key, recalling a name from the memory that corresponds to a telephone number.

3. The method in accordance with claim **1** further including the step of:

in response to a subsequent actuation of the first single-throw function key occurring before said step of connecting a telephone call, entering a mode for entering a telephone number into the memory.

4. A method of operating a radiotelephone, the radiotelephone including a memory, a display, and a keypad with at least a first single-throw function key, a second single-throw function key, and a plurality of data keys, the radiotelephone operating in a standby mode and a talk mode, the method comprising the steps of:

in response to an actuation of the first single-throw function key, when the radiotelephone is in the standby mode and a telephone number has not been selected, entering a mode for accessing a telephone number from the memory;

in response to an actuation of the first single-throw function key, when the radiotelephone is in the standby mode and a telephone number has been selected, connecting a call based on the telephone number, thereby entering the talk mode;

in response to an actuation of the second single-throw function key, when the radiotelephone is in the talk mode, disconnecting the call, thereby entering the standby mode; and

in response to an actuation of the second single-throw function key, when the radiotelephone is in the standby mode, turning off the radiotelephone.

5. The method in accordance with claim **4** further including the step of:

in response to an actuation of at least one key of the data keys, recalling a name from the memory that corresponds to a telephone number.

6. The method in accordance with claim **4** further including the step of:

in response to a subsequent actuation of the first single-throw function key occurring before said step of connecting a telephone call, entering a mode for entering a telephone number into the memory.

7. A method of operating a radiotelephone, the radiotelephone including a memory, a display, and a keypad with at least a first single-throw function key, a second single-throw function key, and a plurality of data keys, the radiotelephone operating in a standby mode and a talk mode, the standby mode including a menu mode, the method comprising the steps of:

in response to an actuation of the first single-throw function key, when the radiotelephone is in the standby mode and a telephone number has been selected, connecting a call based on the telephone number, thereby entering the talk mode;

in response to an actuation of the second single-throw function key when the radiotelephone is in the talk mode, disconnecting the call, thereby entering the standby mode;

when the radiotelephone is in the menu mode and the display shows a selected function, in response to an actuation of the first single-throw function key, changing a current mode of the selected function; and

in response to an actuation of the second single-throw function key when the radiotelephone is in the menu mode, maintaining the current mode of the selected function.

8. The method in accordance with claim **7** wherein the selected function is a phone locking function.

9. The method in accordance with claim **7** wherein the radiotelephone further includes a third single-throw function key, and the method further comprises the steps of:

in response to an actuation of the third single-throw function key and a subsequent actuation of at least one key of the data keys, entering the menu mode with the display showing the current mode of the selected function.

10. A method of operating a radiotelephone, the radiotelephone including a memory, a display, and a keypad with at least a first single-throw function key, a second single-throw function key, and a plurality of data keys, the radiotelephone operating in a standby mode and a talk mode, the method comprising the steps of:

in response to an actuation of the first single-throw function key when the radiotelephone is off, turning on the radiotelephone, thereby entering the standby mode;

in response to actuations of the data keys when the radiotelephone is in the standby mode, displaying a telephone number in the display;

in response to an actuation of the first single-throw function key when the radiotelephone is in the standby

mode and the telephone number is shown in the display, connecting a telephone call based on the telephone number, thereby entering the talk mode;

in response to an actuation of the second single-throw function key during the standby mode when the telephone number is shown in the display, at least partially clearing the telephone number in the display; and

in response to an actuation of the second single-throw function key during the talk mode, disconnecting the call, thereby entering the standby mode.

11. A method of operating a radiotelephone, the radiotelephone including a memory, a display, and a keypad with at least a first single-throw function key, a second single-throw function key, and a plurality of data keys, the radiotelephone having a standby mode and a talk mode, the method comprising the steps of:

in response to an actuation of the first single-throw function key during the standby mode when a telephone number has not been selected, entering a mode for recalling a telephone number from the memory;

in response to an actuation of the first single-throw function key during the standby mode when a telephone number has been selected, attempting to connect a call, thereby entering the talk mode;

in response to an actuation of the second single-throw function key during the standby mode when a telephone number has been selected and shown in the display, at least partially clearing the telephone number from the display; and

in response to an actuation of the second single-throw function key during the talk mode, disconnecting the call, thereby entering the standby mode.

12. The method in accordance with claim **11** wherein said step of at least partially clearing the telephone number further includes the steps of:

in response to an extended actuation of the second single-throw function key, clearing the telephone number shown in the display; and

in response to a non-extended actuation of the second single-throw function key, clearing a last digit of the telephone number shown in the display.

13. The method in accordance with claim **11** further including the step of:

in response to an actuation of at least one key of the data keys after the actuation of the first single-throw function key, recalling a name from the memory based on the at least one key of the data keys.

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